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ABSTRACT

This study of cognitive and perceptual development compared low SES minority urban children participating in special programs with middle SES minority urban children and with the national norms on cognitive and perceptual measures. Subjects were 169 4- and 5-year-old minority urban children attending preschools in a large city. Eighteen middle class children were also included in the study. Four different preschool programs were attended by the Title I children: DISTAR, Modified Responsive Environment Curriculum (REC), Modified DISTAR and an Eclectic program. The CIRCUS tests were used to measure perceptual and cognitive performance. Results are discussed in terms of sex comparisons, program comparisons, and social class and national norm comparisons. Findings indicate that no specific type of preschool program is distinctly better than another on all the cognitive and perceptual measures. A number of implications of the study are discussed. (MS)

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Perceptual and Cognitive Development in Low SES Minority Urban Children: Preschool and Program Impacts[1]

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Perceptual and Cognitive Development in Low SES Minority Children: Preschool and Program Impacts

Introduction

During the sixties a number of experimental preschool programs were developed to improve the academic performance of "disadvantaged" children, and to prepare them for elementary school. A large number of these programs attempted to eliminate the deficit or cumulative deficits attributed to children from low SES groups. Evaluations have indicated that such programs substantially improved the academic achievement of preschool children as measured through intelligence and achievement tests (Bereiter and Engelman, 1966; Gray and Klaus, 1965; Hodges, McCandless and Spiker, 1967; Miller and Dyer, 1975; Klaus and Gray, 1968; and Weikart, 1972). Most of these evaluations, however, were made in controlled settings by program developers or by researchers interested in particular kinds of programs. Now in the seventies, the programs are being implemented in non-controlled or more naturalistic settings such as public and private preschools. Therefore, it is timely to ask "what is the real impact of these programs?" Specifically, "how viable are these programs in meeting the academic needs of minority children from low SES groups?" In an attempt to answer these questions, we investigated how low SES minority urban children participating in special programs compare with middle SES minority urban children and with the national norms on cognitive and perceptual measures.

Method and Procedures

The subjects of our study were four and five year old minority urban children attending preschools in a large city of approximately 800,000.

One hundred and sixty nine subjects were randomly selected from among all the Title 1 schools in the Preschool Expansion Program. These subjects, referred to hereafter as the "Title 1 children" were from low SES groups, and almost all of them were black. Another eighteen subjects, randomly selected from a neighboring school without Title 1 funding, are referred to hereafter as the "Non-Title 1 children." They were from middle SES groups and almost all of them were black. Title 1 children were attending four different types of preschool programs: DISTAR , developed by Becker and Engelman ; Modified Distar, a combination of DISTAR with traditional free play activities; Modified Responsive Environment Curriculum (REC), a combination of REC developed in New Jersey by the Responsive Environment Corporation with traditional free play activities; and an Eclectic teacher designed child centered curriculum. In the Eclectic program teachers used ideas from various components specifically designed to improve perceptual, cognitive and language skills. Some of these were Enrichment through Radio, Microteaching, Early Childhood Continuum and Early Screening Project. Distribution of the sample in the types of preschools is as follows:

Type of Preschool	Title 1 Children	Non-Title 1 Children	Total
DISTAR	37	-	37
Modified Distar	10	18	28
Modified REC	17	-	17
Eclectic	105	-	105

N=187

The measures used in determining perceptual and cognitive performance were the CIRCUS tests (Anderson, 1974) developed at Educational Testing Service. Perceptual learning was measured through CIRCUS tests 3 and 4 on perceptual and perceptual-motor-coordination. These included subtests on visual discrimination: Look-Alikes, Complex Matching, Reversal Errors, and Copy What You See. Cognitive learning was measured through CIRCUS test 5 and 6 on Recognition and Discrimination of Numbers, Capital Letters and Lower Case Letters, and through CIRCUS test 9 on Comprehension, Interpretation and Recall. Testing was conducted in small groups with 6 to 8 children, in two separate sessions lasting approximately 30 minutes. The testers like the children were predominantly black.

Results

Sex Comparisons: T test results indicated no significant differences between the performance of males and females on any of the CIRCUS subtests. These results suggest that at preschool age level, sex differences in the abilities measured have not emerged.

Program Comparisons: Analysis of variance was used to compare effects of the four types of programs on the performance of Title 1 children. Results are presented in Table 1. There were no statistically significant differences among the Title 1 children in the four programs on any of the perceptual and perceptual-motor measures, nor on cognitive measures of Comprehension, Interpretation and Recall. On the cognitive measures of Recognition and Discrimination of Letters and Numbers, there were statistically significant differences among the four programs on Total Scores

($F=3.39$, $p<.05$), Capital Letters ($F=3.17$, $p<.05$) and Lower Case Letters ($F=4.57$, $p<.01$). On Total Scores and on Lower Case Letters, children in the Eclectic and Modified Distar programs had higher mean scores than children in DISTAR and Modified REC programs; children in the Eclectic program had higher mean scores than children in the other three programs on Capital Letters. There were no differences among the children in the four programs on the measure for Recognition and Discrimination of Numbers.

Social - Class and National Norm Comparisons: After comparisons of program effects, the scores of all the Title 1 children were aggregated and analyzed separately from the scores of the Non-Title 1 children for comparisons with national norms.* First, the distributions of the performance scores of Title 1 children and Non-Title 1 children were descriptively compared to the national norm distribution. Then, a test of significance was made by comparing the mean scores of Title 1 children and Non-Title 1 children with the mean scores from the national norms. For the first comparison, raw scores of individual pupils on CIRCUS tests were converted to z scores using means and standard deviations of national norms. The z scores were then converted to stanine scores. The results are presented in Table 2 through 5 for the perceptual, perceptual-motor and cognitive subtests.

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*These norms were provided by the publishers and included 1006 preschool children enrolled in educational programs. The normative group included different geographic areas, community sizes and types of programs. When compared to tests compiled by the National Center for Educational Statistics, it was found that the sample tended to "over-represent children in the Northeast and children in cities of less than 50,000, and under represent children in the Southeast, children in cities over 50,000 and black children" (Anderson, 1974).

The results presented in Table 2 indicate that on two of the perceptual measures, a relatively smaller percentage of Title 1 children performed at or above the 50th percentile level. That is, on Total Scores 31% of the children, and on Complex Matching 40% of the children were distributed between 50th and 98th percentile level. On one perceptual measure, the Reversal Errors subtest, 60% of the Title 1 children had a distribution between the 50th and 100th percentile level. The Non-Title 1 children were distributed at the upper end of the percentile scale on the national norms on the first two measures. Specifically, 62% of the Non-Title 1 children scored above the 50th percentile on Total Scores and 55% scored above the 50th percentile level on Complex Matching. On the Reversal Errors subtest, however, only 28% of the Non-Title 1 children scored between the 50 to 100 percentile level, so they did less well than the Title 1 children on this measure.

The results of the perceptual-motor coordination measure, presented in Table 3, indicate that Title 1 children were distributed throughout the scale, performing at a comparable level to the national norm. Non-Title 1 children on the other hand performed consistently above 50th percentile level.

On the cognitive measure for Recognition and Discrimination of Capital and Lower Case Letters and Numbers, presented in Table 4, the distribution of Title 1 children was comparable to national norms up to the 50th percentile level. However, the distribution of the remaining 50 percent of Title 1 children clustered heavily between 50th and 86th percentile level on the national norms. The distribution of Non-Title 1 children, also clustered

at the middle percentile ranges (between 16th and 84th percentiles) with very few at either end.

On cognitive measures for Comprehension, Interpretation, and Recall, presented in Table 5, a large percent of Title 1 children performed below the 50th percentile level on all subtests. Performance of Non-Title 1 children, however, was comparable to the national norms.

Mean scores of Title 1 children were compared with the mean scores from the national norms using a Z-test for the mean (Kohout, 1974). Results presented in Table 6 indicate significant differences on 8 of the 11 measures. Title 1 children had mean scores significantly lower than national mean scores on two of the visual discrimination tasks, on the cognitive measures for Recognition and Discrimination, and on Comprehension, Interpretation and Recall. The only measure on which the Title 1 children had mean scores higher than the national norm was the visual discrimination task of Reversal Errors.

Z-test comparisons of the Non-Title 1 children's mean scores with the national norms are shown in Table 7. Results indicate that the Non-Title 1 children had higher mean scores than the national norms on two of the visual discrimination measures, on one perceptual motor coordination measure and on two cognitive measures of Recognition and Discrimination of Capital and Lower Case Letters.

Discussion

Our findings indicate that no specific type of preschool program is distinctly better than another on all of the cognitive and perceptual measures. The only measure on which two of the four programs were better

was the cognitive measure of Recognition and Discrimination of Letters, a measurement of low level cognitive skill requiring practice and role learning. The implication of this finding is that for low SES minority children the more effective programs are superior only in improving low level cognitive skills.

While the different types of preschool programs may be generally beneficial to low SES minority urban children, program benefits, as measured by perceptual and cognitive tasks, are not sufficient to enable them to perform at a level comparable to their age group at the national level on most cognitive and perceptual tasks. However, it should be pointed out that although their performance is substantially below national norm, it may be much higher than it would have been in the absence of preschool programs. Notable too, is the fact that middle SES minority urban children in one model program were able to perform above the national norm on perceptual, perceptual-motor and low level cognitive skills as recognition and discrimination of letter and numbers, but not on higher level cognitive skills, such as comprehension, interpretation and recall. Two implications of these research results are that: (1) socio-economic status rather than race or urban environment is the salient factor in the cognitive and perceptual development of children and (2) preschool programs have not had a substantial impact on improving high level cognitive skills. It is recommended, therefore that content and process of model preschool programs be analyzed to determine why, in natural settings, many of them are not successful in bringing the performance of low SES minority urban children up to the national norm; and, why they are least effective in improving high level cognitive skills.

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Table 1

Comparison of Performance of Title 1 Pre-School Children by Program Components on the CIRCUS Measure

1. Perceptual Measures

	Program Component: Distar			Modified Distar			Modified ABC			Eclectic			
	N	$\bar{x}$	σ	N	$\bar{x}$	σ	N	$\bar{x}$	σ	N	$\bar{x}$	σ	F
Circus 3 Total Score Look-Alikes: visual discrimination	37	16.8	4.5	10	16.3	5.1	17	16.5	5.2	105	16.5	4.9	0.03 (df=3,164)
Circus 3 Complex matching visual discrimination	37	6.9	2.5	10	7.1	3.3	17	7.1	2.9	105	6.5	3.1	0.29 (df=3,164)
Circus 3 Reversal errors visual discrimination	37	2.9	1.5	10	3.7	2.5	17	2.8	1.6	105	2.8	1.9	0.51 (df=3,164)
Circus 4 Total Score Copy what you see perceptual-motor coordination	37	34.0	6.4	9	28.4	4.4	15	28.7	7.6	95	30.6	9.1	1.80 (df=3,151)

2. Cognitive measures: Letters and Numbers

Circus 5 Total Score Letters and numbers recognition and discrimination	37	12.9	3.8	10	14.5	3.1	17	13.1	4.2	105	15.3	3.9	3.39* (df=3,164)
Circus 5 Capital letters recognition and discrimination	37	6.4	2.3	10	6.6	2.0	17	6.6	2.0	105	7.6	2.0	3.17* (df=3,164)
Circus 5 Lower case letters recognition and discrimination	37	3.4	1.4	10	4.6	1.2	17	3.9	1.6	105	4.6	1.6	4.57** (df=3,164)
Circus 5 Numbers recognition and discrimination	37	3.0	1.1	10	3.3	1.2	17	2.6	1.2	105	3.0	1.0	0.67 (df=3,164)

3. Cognitive measures: Comprehension, Interpretation and Recall

Circus 9 Total Score Comprehension, Interpretation and Recall	37	13.6	3.4	9	11.8	3.0	15	13.9	3.9	95	14.4	3.8	1.21 (df=3,151)
Circus 9 Comprehension	37	8.8	2.6	9	7.0	2.7	15	8.1	2.7	95	9.0	2.7	1.45 (df=3,151)
Circus 9 Interpretation	37	4.9	1.7	9	4.8	1.4	15	5.8	1.8	95	5.4	1.9	1.06 (df=3,151)

* $p < .05$

** $p < .01$

Table 2

Distribution of Title 1 and Non-Title 1 Children on
CIRCUS 3 Perceptual Measures Using the National CIRCUS Norms

	TOTAL SCORES						COMPLEX MATCHING						REVERSAL [illegible]					
	Title 1 Children			Non-Title 1 Children			Title 1 Children			Non-Title 1 Children			Title 1 Children			[illegible] Title 1 Children		
Percentile Distribution	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	[illegible]	Cumulative Percentage
Below 2nd Percentile	10	5.9%	5.9%	-	____	____	5	2.9%	2.9%	-	____	____	-	____	____	-	____	____
2 to 6 Percentile	17	10.0%	15.9%	-	____	____	23	13.5%	16.5%	-	____	____	-	____	____	-	____	____
7 to 15 Percentile	41	24.1%	40.0%	-	____	____	12	7.1%	23.5%	-	____	____	10	5.9%	5.9%	5	[illegible]	27.6%
16 to 30 Percentile	21	12.4%	52.3%	-	____	____	42	24.7%	48.2%	3	16.7%	16.7%	32	18.8%	24.7%	4	[illegible]	50%
31 to 49 Percentile	28	16.5%	68.8%	7	38.9%	38.9%	20	11.8%	60.0%	5	27.8%	44.4%	29	17.1%	41.8%	4	[illegible]	72.2%
50 to 69 Percentile	19	11.2%	80.0%	3	16.7%	55.5%	35	20.6%	80.6%	2	11.1%	55.6%	0	0%	41.8%	-	____	____
70 to 84 Percentile	20	11.8%	91.8%	1	5.6%	61.1%	24	14.1%	94.7%	3	16.7%	72.2%	41	24.1%	65.9%	2	[illegible]	83.3%
85 to 93 Percentile	6	3.5%	95.3%	4	22.2%	83.3%	8	4.7%	99.4%	3	16.7%	88.9%	31	18.2%	84.1%	1	[illegible]	88.9%
94 to 97.7 Percentile	8	4.7%	100%	3	16.7%	100%	1	0.6%	100%	2	11.1%	100%	9	9.4%	93.5%	2	[illegible]	100%
97.7 to 100 Percentile	__	____	____	-	____	____	-	____	____	-	____	____	11	6.5%	100%	-	____	____
TOTAL:	170	100%	100%	18	100%	100%	170	100%	100%	170	100%	100%	170	100%	100%	18	[illegible]	100%

Table 3

Distribution of Title 1 and Non-Title 1
Children on CIRCUS 4 - Perceptual Motor Coordination Measure
Using the National CIRCUS Norms

Percentile Distribution	Title 1 Children			Non-Title 1 Children		
	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage
Below 2 Percentile	4	2.4%	2.4%	-	___	___
2 to 6 Percentile	9	5.3%	7.7%	-	___	___
7 to 15 Percentile	11	6.5%	14.2%	-	___	___
16 to 30 Percentile	34	20%	34.2%	-	___	___
31 to 49 Percentile	25	14.7%	48.9%	-	___	___
50 to 69 Percentile	33	19.4%	68.3%	2	11.1%	11.1%
70 to 84 Percentile	23	13.5%	81.7%	2	11.1%	22.2%
85 to 93 Percentile	24	14.1%	95.9%	12	66.7%	88.9%
93 to 97.7 Percentile	4	2.4%	98.3%	2	11.1%	100%
97.7 to 100 Percentile	3	1.8%	100%	-	___	___
TOTAL:	170	100%	100%	18	100%	100%

Table 4

Distribution of Title 1 and Non-Title 1 Children on CIRCUS 5 Cognitive Measures Using the Natural CIRCUS Norms

	TOTAL SCORES						CAPITAL LETTERS					
	Title 1 Children			Non-Title 1 Children			Title 1 Children			Non-Title 1 Children		
Percentile Distribution	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage
Below 2nd Percentile	15	8.9%	8.9%	-	——	——	12	7.1%	7.1%	-	——	——
2 to 6 Percentile	11	6.5%	15.4%	1	5.6%	5.6%	11	6.5%	13.5%	1	5.6%	5.6%
7 to 15 Percentile	20	11.8%	27.2%	-	——	——	10	5.9%	19.4%	-	——	——
16 to 30 Percentile	17	10%	37.2%	1	5.6%	11.1%	20	11.8%	31.2%	2	11.1%	16.7%
31 to 49 Percentile	24	14.1%	51.3%	1	5.6%	16.7%	25	14.7%	45.9%	1	5.6%	22.2%
50 to 69 Percentile	31	18.2%	69.5%	4	22.2%	38.9%	20	11.8%	57.6%	5	27.8%	50%
70 to 84 Percentile	44	25.9%	95.4%	9	50%	88.9%	72	100%	100%	9	50%	100%
85 to 93 Percentile	8	4.7%	100%	1	5.6%	94.4%	—	——	——	-	——	——
94 to 97.7 Percentile	—	——	——	-	——	——	—	——	——	-	——	——
97.7 to 100 Percentile	—	——	——	1	5.6%	100%	—	——	——	-	——	——
TOTAL:	170	100%	100%	18	100%	100%	170	100%	100%	18	100%	100%

	LOWER CASE LETTERS						NUMBERS					
	Title 1 Children			Non-Title 1 Children			Title 1 Children			Non-Title 1 Children		
Percentile Distribution	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage
Below 2nd Percentile	9	5.3%	5.3%	-	——	——	13	7.6%	7.6%	7	38.9%	38.9%
2 to 6 Percentile	8	10.6%	15.9%	1	5.6%	5.6%	—	——	——			
7 to 15 Percentile	9	17.1%	32.9%	1	5.6%	11.1%	40	23.5%	31.1%	2	11.1%	50%
16 to 30 Percentile	1	.6%	33.5%	1	5.6%	16.7%	1	0.6%	31.7%	1	5.6%	55.6%
31 to 49 Percentile	0	17.6%	51.2%	-	——	——	63	37.1%	68.9%	7	38.9%	94.4%
50 to 69 Percentile	6	15.3%	66.5%	1	5.6%	22.2%	11	24.1%	92.9%	-		
70 to 84 Percentile	1	33.5%	100%	14	77.8%	100%	—	——	——	-		
85 to 93 Percentile	-	——	——	—	——	——	12	7.1%	100%	1	5.6%	100%
94 to 97.7 Percentile	-	——	——	—	——	——	—	——	——	-		
97.7 to 100 Percentile	-	——	——	—	——	——	—	——	——	-		
TOTAL:	70	100%	100%	18	100%	100%	170	100%	100%	18	100%	100%

Table 5

Distribution of Title 1 and Non-Title 1 Children on
CIRCUS 9 Cognitive Measure Using National CIRCUS Norms

	TOTAL SCORES						COMPREHENSION						INTERPRETATION AND RECALL					
	Title 1 Children			Non-Title 1 Children			Title 1 Children			Non-Title 1 Children			Title 1 Children			Non-Title 1 Children		
Percentile Distribution	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage	N	Percentage	Cumulative Percentage
Below 2 Percentile	16	9.4%	9.4%	1	5.6%	5.6%	36	21.2%	21.2%	1	5.6%	5.6%	9	5.3%	5.3%	--	---	---
2 to 6 Percentile	26	15.3%	24.7%	–	---	---	14	8.2%	29.4%	–	---	---	13	7.6%	12.9%	–	---	---
7 to 15 Percentile	35	20.6%	45.3%	–	---	---	22	12.9%	42.3%	1	5.6%	11.1%	36	21.2%	34.1%	1	.6%	5.6%
16 to 30 Percentile	42	24.7%	70%	4	22.2%	27.8%	35	20.6%	62.9%	6	33.3%	44.4%	41	24.1%	58.2%	4	.2%	27.8%
31 to 49 Percentile	31	18.2%	88.2%	5	27.8%	55.6%	16	9.4%	72.3%	2	11.1%	55.5%	32	18.8%	77.1%	2	.1%	38.9%
50 to 69 Percentile	13	7.6%	95.9%	4	22.2%	77.8%	13	7.6%	80%	4	22.2%	77.8%	23	13.5%	90.6%	2	.1%	50%
70 to 84 Percentile	5	2.9%	98.8%	3	16.7%	94.4%	8	4.7%	84.7%	2	11.1%	88.9%	8	4.7%	95.3%	5	.8%	77.8%
85 to 93 Percentile	2	1.2%	100%	1	5.6%	100%	5	2.9%	87.6%	1	5.6%	94.4%	7	4.1%	99.4%	2	.1%	88.9%
94 to 97.7 Percentile	—	———	———	–	———	———	—	———	———	–	———	———	1	.6%	100%	2	.1%	100%
97.7 to 100 Percentile	—	———	———	–	———	———	21	12.4%	100%	1	5.6%	100%	–	———	———	–	———	———
TOTAL:	170	100%	100%	18	100%	100%	170	100%	100%	18	100%	100%	170	100%	100%	18	[illegible]	100%

Table 6

Z-Test For Comparison Between the
Mean Scores of Title 1
Children and the Mean Scores for CIRCUS Norm Population

MEASURE	Population Norms μ	σ	Low SES Group N	x	S.S.	Z
CIRCUS 3 Total Scores	19.1	4.9	170	16.6	4.8	-6.71**
CIRCUS 3 Complex Matching	7.9	3.2	170	6.7	3.0	-4.99**
CIRCUS 3 Reversal Errors	2.0	1.5	169	2.9	1.8	7.90**
CIRCUS 4 Total Scores	31.1	8.2	156	31.1	8.3	0.02
CIRCUS 5 Total Scores	15.1	4.2	169	14.5	4.0	-1.81
CIRCUS 5 Capital Letters	7.4	2.1	169	7.2	2.1	0.16
CIRCUS 5 Lower Case Letters	4.7	1.6	169	4.3	1.6	-3.38**
CIRCUS 5 Numbers	3.4	1.2	169	3.0	1.0	-4.46**
CIRCUS 9 Total Scores	18.0	4.2	156	14.0	3.7	-11.80**
CIRCUS 9 Comprehension	11.3	2.6	156	8.8	2.7	-12.22*
CIRCUS 9 Interpretation	6.8	2.1	156	5.3	1.8	-8.99**

** $p<.01$

Table 7

Z-Test for Comparison Between the
Mean Scores of Non-Title 1
Children and the Mean Scores for CIRCUS Norm Population

MEASURE	Population Norms μ	σ	Middle SES Group N	X	S.D.	Z
CIRCUS 3 Total Scores	19.1	4.9	18	21.4	3.3	1.98*
CIRCUS 3 Complex Matching	7.9	3.2	18	9.1	2.7	3.87**
CIRCUS 3 Reversal Errors	2.0	1.5	18	1.8	1.7	0.63
CIRCUS 4 Total Scores	31.1	8.2	18	40.5	3.7	4.95**
CIRCUS 5 Total Scores	15.1	4.2	18	17.1	2.9	1.98**
CIRCUS 5 Capital Letters	7.4	2.1	18	8.1	1.4	2.22*
CIRCUS 5 Lower Case Letters	4.7	1.6	18	5.5	1.2	2.20*
CIRCUS 5 Numbers	3.4	1.2	18	3.4	0.8	0.04
CIRCUS 9 Total Scores	18.0	4.2	18	18.2	3.6	0.20
CIRCUS 9 Comprehension	11.3	2.6	18	10.7	2.3	-1.03
CIRCUS 9 Interpretation	6.8	2.1	18	7.5	1.7	1.48

*$p<.05$
**$p<.01$